ArcGIS Migration:
Written For GIS Managers

Connecticut EWTA

November 2002

Prepared for:

The Connecticut Enterprise Wide Technology Architecture
Application Development Domain Team
GIS Standards Subcommittee
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Section 1: Introduction

Environmental Systems Research Institute, Inc. (ESRI) is pleased to provide the Connecticut Enterprise Wide Technology Committee with these guidelines for ArcView GIS and ARC/INFO migration to ArcGIS version 8. ESRI acknowledges the importance of understanding thoroughly all aspects of migration before adopting ArcGIS in a production environment. It is our strategy to provide the necessary resources to educate and support users during the migration process.

One commonly asked question is, "Why migrate?" Both ArcView GIS (ArcView 3.x) and ARC/INFO were developed as state-of-the-art GIS platforms on the latest available technology. ArcView GIS is one of the few desktop GIS that operate identically on Windows and UNIX operating systems. ARC/INFO is an industrial strength toolkit of GIS functions that are automated by an easy to learn, ASCII-based scripting language (AML). Both products set standards for GIS software.

However, the technologies that form the foundation of our software (such as operating systems, relational databases and application development languages) continue to evolve. For this reason, ESRI combined the strengths of the ArcView interface and the power of ARC/INFO with technology standards that support greater feature-functionality, stronger integration with other software and smarter database storage. Simply adding new features to ArcView GIS and ARC/INFO would not leverage modern advances in object-oriented software production, object-relational database management and industry standard scripting languages. This is what ArcGIS provides.

The purpose of this document is to introduce you to general migration considerations and the resources available to aid you in preparing to migrate.

Section 2: Considerations

Listed below are categories that should be considered as part of a migration workflow. Some sites may benefit from undertaking migration as a formal change-management project. GIS is not simply software. GIS is business intelligence and applications vital to an organization. As such, organizations may choose to monitor the resource use and return-on-investment gained from migration.

ArcGIS is used daily in mission critical applications around the world in organizations just like yours. It integrates with existing systems by *design*; it's design is premised on enterprise systems ranging anywhere from a single installation of ArcView to a multi-user, versioned database serving many flavors of client applications; including geoprocessing services provided over the web. If your organization does not yet view GIS as "mission critical", then migration is a perfect opportunity to reintroduce it that way.

Some of you may approach migration as a project requiring change management, possibly involving a GIS consultant. Others can begin by using the list below as a starting point in your continued research.

I. Custom Applications

ArcGIS is built upon C++ object components designed for the Windows platform. It is modeled in many ways after the Microsoft Office suite, which supports a common scripting language across all applications (VBA). Avenue scripts and AML's are not supported in desktop GIS (it is important to note that AML's continue to be supported in workstation version 8.x installations on Windows and UNIX.)

Inventory all application software you rely upon. Consider not only custom-built applications, but also generic scripts that you may have downloaded or acquired. For example, Xtools, which is the most popular ArcView GIS script (56,077 downloads as of 10/30/00, http://arcscripts.esri.com/Scripts.asp?n=t) can also be downloaded in a new ArcGIS format (http://arcscripts.esri.com/details.asp?dbid=11731).

After inventorying your applications, evaluate whether they can be supported directly in ArcGIS. Consider that many Avenue scripts were developed to streamline an editing process or to automate cartographic design. ArcGIS is far superior in its editing and map design capabilities. What required a script in the past may now be supported out-of-the-box in ArcGIS.

For your larger applications, begin by documenting the workflow logic, which will greatly aid the development of new application software. Acknowledging that rewriting an application is painful, ArcGIS will offer you a new way to approach an old problem, particularly when integrating GIS with other technology. For example, ArcGIS offers a completely new capability to integrate web services, as well as hundreds of custom interfaces designed for Windows, such as charting software, video logging and database interfaces. Consider also that an application you deploy today in Avenue can reach a much greater audience as an ArcIMS web-based application in the future.

Refer to the **Resources** section below to learn more about the many sources of support to aid your application migration.

II. Databases and Data Models

With the release of ArcGIS, ESRI introduced a new method of storing spatial data and attributes with rules governing their behavior, in a format called the Geodatabase. A geodatabase stores feature classes just as an ARC/INFO coverage contains feature classes. A critical difference being that geodatabases are scalable to store large numbers of features seamlessly, while supporting multiple, simultaneous editors, large raster storage (images), and built-in data integrity controls.

A geodatabase also stores the rules of topology, or the rules of how features interact with each other. Users of coverage data are familiar with how topology constructs are stored with spatial features. The geodatabase is the next evolution in database topology. Now, rules are stored within data tables. The software uses these rules to "discover" topological relationships between features dynamically. Geodatabase topology supports inter-feature class relationships, automatic discovery of topology violations, support of rule exceptions, and many new additions to our traditional topology understanding.

A geodatabase offers a much broader data modeling opportunity than coverages or ArcView GIS shapefiles ever did. Today, you can achieve greater performance for a larger number of end users, and store intelligence (and metadata) within the geodatabase. Accordingly, ArcGIS is optimized to take full advantage of geodatabase benefits.

There are two components of migration to a geodatabase, data format and data model. Geodatabases are stored in Microsoft Access (the personal geodatabase) or in a relational database management system (RDBMS), such as SQL Server, Oracle, DB2, Informix and Sybase. Your data migration may begin by simply changing the format that your data is stored in, from a coverage or shapefile to a geodatabase. Migrating shapefiles and coverages to a geodatabase can be as simple as an export/import menu choice in ArcCatalog (a data exploration ArcGIS application). Simply moving from the "tiles and files" storage of coverages and shapefiles to a relational database may greatly enhance the performance of reading your data, especially when reading it over a network.

The second major consideration in data migration is the data model, or data schema used to model your spatial features. Coverages and shapefiles offered a subset of the schema options available in a geodatabase. The long-term goal of any geodatabase migration should include an exercise in reviewing user needs in the context of your data model. ESRI offers example data models organized by industry segment. First, load existing data into a geodatabase, as-is. Use the software and become familiar with the new capabilities. Then, review our on-line data models and prepare to organize your data in a much more meaningful and intuitive way.

As with application migration, ESRI offers numerous resources to assist you in evaluating your data migration process. Refer to the **Resources** section below.

III. Cartography

The end result of much of our work is a printed map. How our maps look is important to us. The technical aspects of map design involve cartographic *properties*, such as symbology, thematic classification and page layout. ArcGIS introduces a significant improvement in how cartography is managed and presented in a GIS interface.

Users migrating from ArcView GIS and ARC/INFO will want to consider how their themes are classified and which symbology is used. ArcView GIS users can save their cartographic properties as *legend files*. In ArcGIS, a similar but greatly expanded concept

is the *layer file*. Layer files can import most all of the characteristics of an ArcView GIS legend file; which is one method to start your cartography migration.

ArcGIS includes hundreds of True Type Font symbols organized by industry segment. Many of the custom symbols hand created for ArcView GIS and ARC/INFO are available out-of-the-box in ArcGIS. A much richer collection of cartographic elements are also included with ArcGIS. These include north arrows, scale bars, legends, neatlines, reference grids, extent rectangles, etc. Finally, a complete symbology editor is included with ArcGIS allowing you to modify and create custom point, line and area symbols.

In addition to symbology, ArcGIS offers new and improved map template functionality. Templates store page layout specifications (i.e., page size, orientation), cartographic elements (including inset maps), default map layers, and other map properties that can be applied dynamically to any data. This new approach allows you to work freely with data while applying a variety of cartographic designs dynamically (e.g., print "A" size and "E" size maps on-demand, from a simple menu choice). ArcGIS templates exceed the capabilities of ARC/INFO map compositions and ArcView GIS layouts.

See the **Resources** section below for further investigation.

IV. Document Management

ArcView GIS (ArcView 3.x) stored maps, views, scripts, and other documents in a *project* file (*.apr). Project files conveniently group together elements of a typical GIS project. They are often used to share entire projects between groups of users. In this manner, all the data, maps and scripts that comprise a project can be combined and shared easily. (ARC/INFO does not have the concept of a project file, although users of the AML application called *ArcTools* would find their *Views* and *Layouts* similar).

ArcGIS stores views of data and scripts in what is called a *map document* (*.mxd). Map documents are most analogous to a single ArcView 3.x layout. They contain groupings of layer files inside data frames. Data frames are organized on a layout (page layout) alongside cartographic elements to form a single map document. (Recall the discussion above in the **Cartography** section regarding map templates. Templates are applied one-at-a-time to a map document.) Map documents also contain any customization of the interface, including scripts and extensions.

The ArcGIS equivalent of an ArcView GIS project file is a folder (subdirectory) containing one or more map documents. In ArcView GIS, you collected a series of map layouts into a single file. In ArcGIS, each map document (*.mxd file) is equivalent to a layout; so a collection of ArcView GIS layouts is similar to a directory of map documents.

A migration of ArcView GIS to ArcGIS should include a study of how ArcView GIS project files are created and distributed. In many cases, sharing ArcGIS layer files (now containing all display properties) and map templates (easily applied on-the-fly) will

replace distribution of ArcView GIS project files. In other cases, multiple map documents (which support copy-and-paste operations of layer files and data frames) can be organized collectively and shared as a group of files.

See the **Resources** section below for further investigation.

V. Hardware Requirements

There are two important considerations regarding the performance of ArcGIS:

1. ESRI continues to improve performance with each release of ArcGIS. ArcView GIS and ARC/INFO users should migrate to the latest available release of ArcGIS to guarantee the best possible performance (version 8.2, as of 10/30/2002). For example, the draw-time performance of ArcGIS 8.2 is significantly faster than that of version 8.1.

2. ArcGIS performance is dependent upon data format and the method with which data is accessed. Data can be accessed locally, over a LAN by reading network drives, over a LAN/WAN via TCP/IP communication, or using HTTP protocol over a network of any size. All of the above are possibilities in ArcGIS.

   There are now many more options available to store and retrieve data for use in ArcGIS. Enterprise geodatabases are easily scaled to provide fast performance to hundreds of users. Geodatabases can also be deployed as image services through a web server. Our experience is that upgrading to more powerful client platforms is not always the best way to improve application performance. Data model and data storage may be equally important. If your data is distributed for network access, migrating into an enterprise database may be effective than upgrading client hardware.

Specific ArcGIS hardware specifications can be found on-line at these locations:

http://arconline.esri.com/arconline/sysreqs.cfm?R=many&PID=1

http://www.esri.com/library/whitepapers/pdfs/sysdesig.pdf

Section 3: Resources

Below is a list of resources available to assist you in your migration planning.

Migration Support In-The-Box

ArcView/ArcEditor/ArcInfo Desktop Help Topics

"Modeling Our World", A GeoDatabase Reference (hard copy and pdf).

ESRI On-Line Support, http://support.esri.com

Participate in Discussion Topics http://forums.esri.com/forums.asp?c=93

Search an Expert Knowledge Base http://support.esri.com/

Download Data Models
http://www.esri.com/software/arcgisdatamodels/index.html

Download Scripts http://arcobjectsonline.esri.com/

Read Migration Documents
http://support.esri.com/products/browse/default.asp?p=28&pid=25,28,29,30&pf=538

Business Partners

Migration Assistant – ArcView 8 On-Line Help Written for Those Who Speak ArcView 3.x

http://www.migrationassistant.com/

"Avenue Wraps" – A Book of ArcView 8 Visual Basic Wrappers for Avenue, and more

http://www.cedracorporation.org/Happening.html

ArcGIS Upgrade CD

http://www.penbaymedia.com/specials.html

Database Migration Utility

http://www.laurelhillgis.com/

Many of Our Local Partners Provide Migration Services. Please Contact Your ESRI Regional Office for a Reference.

ESRI Migration Seminars (focused presentations and discussion)

Migrating To ArcView 8 http://gis.esri.com/events/seminarlist.cfm

Migrating Coverages to Geodatabases (schedule to be announced)

Land Records Management and the Parcel GeoDatabase Model (schedule to be announced)

Section 4: Conclusions

The creators of ARC/INFO and ArcView GIS are the same who bring you ArcGIS. They have improved upon their creation to include the strengths of both products. ArcGIS will offer you new opportunities to complete your tasks more productively. It is an architecture that will support an era of GIS rivaling any ESRI has created before.

There is one final and critical resource for those of you who may be struggling with migration, or just wondering where to begin, your ESRI Regional Office. We work with our customers on migration. We want to hear your migration story. Contact us at ESRI-Boston at 978-777-4543, boston@esri.com.